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(54) **USING ATTRIBUTES ON A SOCIAL NETWORK FOR DECISION-MAKING SUPPORT**

(71) Applicant: **LinkedIn Corporation**, Mountain View, CA (US)

(72) Inventors: **Christina Allen**, Palo Alto, CA (US); **Farid Hosseini**, San Francisco, CA (US); **M. Christopher Pruet**, Los Gatos, CA (US); **Sarah Jean Culberson Alpern**, Sunnyvale, CA (US)

(73) Assignee: **LinkedIn Corporation**, Mountain View, CA (US)

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G06F 17/30	(2006.01)
G06Q 10/10	(2012.01)
G06Q 50/00	(2012.01)

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CPC ***H04L 67/22*** (2013.01); ***G06F 17/30*** (2013.01); ***G06F 17/3053*** (2013.01); ***G06F 17/30554*** (2013.01); ***G06Q 10/105*** (2013.01); ***G06Q 50/01*** (2013.01); ***H04L 67/306*** (2013.01)

(58) **Field of Classification Search**

CPC G06F 17/30867; G06F 17/3053; G06F 17/30554; G06F 17/30864

USPC 715/753

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,594,673 B1	7/2003	Smith et al.
7,539,697 B1	5/2009	Akella et al.

(Continued)

FOREIGN PATENT DOCUMENTS

CN	103502975 A	1/2014
DE	212013000002 U1	9/2013
WO	WO-2013131108 A1	9/2013

OTHER PUBLICATIONS

"U.S. Appl. No. 13/710,248, Final Office Action mailed Mar. 30, 2015", 23 pgs.

(Continued)

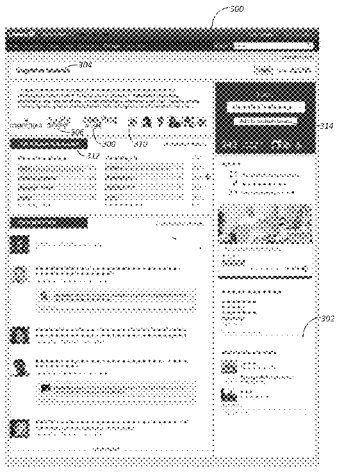
Primary Examiner — Sherrod Keaton

(74) *Attorney, Agent, or Firm* — Schwegman Lundberg & Woessner, P.A.

(57) **ABSTRACT**

A first member of a social network service provides a set of desired attributes and a designation of the type of a candidate having the desired attributes that is desired as a recommendation. The attributes of the profiles of other members of the social networks are searched for entities having the set of desired attributes. At least one of the entities having the desired attributes that result from the search is presented to the first member as the recommendation of a candidate. The first member may provide a second set of desired attributes and a designation of the type of at least one second candidate having the second set of desired attributes. The attributes of the profiles of the other members of the social network may be searched for second entities having the second set of desired attributes. The first member is presented with at least one of the second entities as the recommendation of a second candidate.

18 Claims, 10 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

7,593,740	B2	9/2009	Crowley et al.	
7,945,862	B2	5/2011	Aldrich et al.	
8,060,451	B2	11/2011	Degeratu et al.	
8,412,564	B1	4/2013	Thell et al.	
8,650,177	B2	2/2014	Skomoroch et al.	
8,661,034	B2	2/2014	Polonsky et al.	
8,935,263	B1	1/2015	Rodriguez et al.	
8,938,690	B1	1/2015	Khouri et al.	
2002/0181685	A1	12/2002	Doherty et al.	
2003/0187813	A1	10/2003	Goldman et al.	
2005/0015432	A1	1/2005	Cohen	
2005/0159970	A1	7/2005	Buyukkokten et al.	
2005/0165594	A1	7/2005	Chandra et al.	
2006/0042483	A1	3/2006	Work et al.	
2006/0136419	A1	6/2006	Brydon et al.	
2006/0184464	A1	8/2006	Tseng et al.	
2006/0218111	A1	9/2006	Cohen	
2006/0229896	A1*	10/2006	Rosen	G06Q 10/1053 705/321
2007/0106780	A1	5/2007	Farnham et al.	
2007/0202475	A1	8/2007	Habichler et al.	
2008/0065481	A1	3/2008	Immorlica et al.	
2008/0077461	A1	3/2008	Glick	
2008/0172415	A1	7/2008	Fakhari et al.	
2008/0313000	A1	12/2008	Degeratu et al.	
2009/0006193	A1	1/2009	Forbes et al.	
2009/0027392	A1	1/2009	Jadhav et al.	
2009/0228830	A1	9/2009	Herz et al.	
2009/0299990	A1	12/2009	Setlur et al.	
2010/0082427	A1	4/2010	Burgener et al.	
2010/0161369	A1	6/2010	Farrell et al.	
2010/0169364	A1	7/2010	Hardt	
2010/0293247	A1	11/2010	Mckee et al.	
2011/0078188	A1	3/2011	Li et al.	
2011/0196924	A1	8/2011	Hargarten et al.	
2011/0209068	A1*	8/2011	Vemuri	G06Q 10/06 715/738
2011/0213785	A1	9/2011	Kristiansson et al.	
2011/0238591	A1	9/2011	Kerr et al.	
2011/0258042	A1	10/2011	Purvy et al.	
2011/0288851	A1	11/2011	Duan	
2011/0302159	A1*	12/2011	Mikesell	G06F 17/30386 707/723
2012/0023030	A1	1/2012	Jeffries	
2012/0095933	A1	4/2012	Goldberg	
2012/0110071	A1	5/2012	Zhou et al.	
2012/0197733	A1	8/2012	Skomoroch et al.	
2012/0197863	A1	8/2012	Skomoroch et al.	
2012/0197906	A1	8/2012	Landau et al.	
2012/0197993	A1	8/2012	Skomoroch et al.	
2012/0226623	A1	9/2012	Jurney et al.	
2012/0259791	A1	10/2012	Zoidze	
2012/0311462	A1*	12/2012	Devecka	H04W 4/206 715/753
2013/0046704	A1*	2/2013	Patwa	G06Q 10/06 705/321
2013/0091071	A1	4/2013	Davies	
2013/0124268	A1	5/2013	Hatton et al.	
2013/0159325	A1	6/2013	Polonsky et al.	
2013/0212032	A1	8/2013	Cox et al.	
2013/0254213	A1	9/2013	Cheng et al.	
2013/0254303	A1	9/2013	Cheng et al.	
2013/0254305	A1	9/2013	Cheng et al.	
2014/0025427	A1	1/2014	Bastian et al.	
2014/0081928	A1	3/2014	Skomoroch et al.	
2014/0129631	A1	5/2014	Jayaram et al.	
2014/0164952	A1	6/2014	Allen et al.	
2015/0026120	A1	1/2015	Chrapko et al.	

OTHER PUBLICATIONS

"U.S. Appl. No. 13/710,248, Non Final Office Action mailed Nov. 17, 2014", 21 pgs.

"U.S. Appl. No. 13/710,248, Response filed Mar. 17, 2015 to Non Final Office Action mailed Nov. 17, 2014", 14 pgs.

"CollegeView", Wayback machine on Nov. 10, 2014, [Online]. Retrieved from the Internet: <http://www.collegeview.com/index.jsp>, (Nov. 23, 2012), 1 pg.

"U.S. Appl. No. 13/357,171, Non Final Office Action mailed Jun. 17, 2013", 9 pgs.

"U.S. Appl. No. 13/357,171, Notice of Allowance mailed Oct. 1, 2013", 10 pgs.

"U.S. Appl. No. 13/357,171, Response filed Sep. 17, 2013 to Non Final Office Action mailed Jun. 17, 2013", 12 pgs.

"U.S. Appl. No. 13/357,360, Final Office Action mailed Jun. 27, 2013", 22 pgs.

"U.S. Appl. No. 13/357,360, Non Final Office Action mailed Oct. 11, 2012", 13 pgs.

"U.S. Appl. No. 13/357,360, Response filed Mar. 18, 2013 to Non Final Office Action mailed Oct. 11, 2012", 17 pgs.

"U.S. Appl. No. 13/357,360, Response filed Nov. 20, 2013 to Final Office Action mailed Jun. 27, 2013", 18 pgs.

"U.S. Appl. No. 13/430,284, Non Final Office Action mailed Oct. 23, 2014", 19 pgs.

"U.S. Appl. No. 13/430,284, Response filed Apr. 23, 2015 to Non Final Office Action mailed Oct. 23, 2014", 10 pgs.

"U.S. Appl. No. 13/482,884, Final Office Action mailed Feb. 6, 2014", 19 pgs.

"U.S. Appl. No. 13/482,884, Non Final Office Action mailed Jul. 15, 2013", 19 pgs.

"U.S. Appl. No. 13/482,884, Non Final Office Action mailed Jul. 16, 2015", 26 pgs.

"U.S. Appl. No. 13/482,884, Non Final Office Action mailed Oct. 3, 2012", 19 pgs.

"U.S. Appl. No. 13/482,884, Non Final Office Action mailed Nov. 19, 2014", 23 pgs.

"U.S. Appl. No. 13/482,884, Response filed Jan. 2, 2013 to Non Final Office Action mailed Oct. 3, 2012", 11 pgs.

"U.S. Appl. No. 13/482,884, Response filed Mar. 19, 2015 to Non Final Office Action mailed Nov. 19, 2014", 25 pgs.

"U.S. Appl. No. 13/482,884, Response filed Jul. 7, 2014 to Final Office Action mailed Feb. 6, 2014", 12 pgs.

"U.S. Appl. No. 13/482,884, Response filed Oct. 15, 2013 to Non Final Office Action mailed Jul. 15, 2013", 11 pgs.

"U.S. Appl. No. 13/548,957, Non Final Office Action mailed Jun. 18, 2015", 20 pgs.

"U.S. Appl. No. 13/672,377, Final Office Action mailed Jul. 2, 2015", 8 pgs.

"U.S. Appl. No. 13/672,377, Non Final Office Action mailed Dec. 4, 2014", 9 pgs.

"U.S. Appl. No. 13/672,377, Response filed Apr. 6, 2015 to Non Final Office Action mailed Dec. 4, 2014", 13 pgs.

"U.S. Appl. No. 14/072,955, Non Final Office Action mailed May 9, 2014", 11 pgs.

"U.S. Appl. No. 14/072,955, Preliminary Amendment filed Dec. 10, 2013", 10 pgs.

"European Application Serial No. 13733942.0, Office Action mailed Nov. 4, 2013", 2 pgs.

"International Application Serial No. PCT/US2013/033857, International Preliminary Report on Patentability mailed Oct. 9, 2014", 9 pgs.

"International Application Serial No. PCT/US2013/033857, International Search Report mailed Jul. 2, 2013", 2 pgs.

"International Application Serial No. PCT/US2013/033857, Written Opinion mailed Jul. 2, 2013", 7 pgs.

"International Application Serial No. PCT/US2013/068763, International Search Report mailed May 2, 2014", 2 pgs.

"International Application Serial No. PCT/US2013/068763, Written Opinion mailed May 2, 2014", 5 pgs.

Ackerman, Mark, "Sharing Expertise: Beyond Knowledge Management", The MIT Press (Cambridge, Massachusetts), (2003), 438 pgs.

Becerra-Fernandez, Irma, "Searching for Experts on the Web: A Review of Contemporary Expertise Locator Systems", ACM Transactions on Internet Technology 6(4), (Nov. 2006), 333-355.

D'Amore, Raymond, "Expertise Community Detection", SIGIR, (Jul. 25-29, 2004), 498-499.

Dom, Byron, et al., "A Bayesian Technique for Estimating the Credibility of Question Answerers", SIAM, (2008), 399-409.

(56) **References Cited**

OTHER PUBLICATIONS

Dom, Byron, et al., "Graph-Based Ranking Algorithms for E-mail Expertise Analysis", DMKD, (Jun. 13, 2003), 42-48.

Fu, Yupeng, et al., "Finding Experts Using Social Network Analysis", IEEE/WIC/ACM International Conference on Web Intelligence, (2007), 77-80.

Grolmus, Petr, et al., "A Web-Based User-Profile Generator: Foundation for a Recommender and Expert Finding System", 8th ICCC International Conference on Electronic Publishing, (Jun. 2004), 331-342.

Haselmann, Till, et al., "Towards a Conceptual Model for Trustworthy Skills Profiles in Online Social Networks", ERCIS, (2010), 13 pgs.

Huh, Eui-Nam, et al., "A Framework of Online Community based Expertise Information Retrieval on Grid", Kyung Hee University Memo, (Aug. 11, 2008), 21 pgs.

Huh, Eui-Nam, et al., "A Framework of Online Community based Expertise Information Retrieval on Grid", Kyung Hee University Memo, (Jan. 14, 2010), 21 pgs.

John, Ajita, et al., "Collaborative Tagging and Expertise in the Enterprise", WWW2006, (May 22-26, 2006), 6 pgs.

Li, Juanzi, et al., "EOS: Expertise Oriented Search Using Social Networks", WWW 2007 / Poster Paper, (May 8-12, 2007), 1271-1272.

Lin, Ching-Yung, et al., "SmallBlue: Social Network Analysis for Expertise Search and Collective Intelligence", IEEE International Conference on Data Engineering, (2009), 1483-1486.

Malek, Maria, et al., "Exhaustive and Guided Algorithms for Recommendation in a Professional Social Network", EISTI-Laris laboratory, PRES Cergy University, (Jul. 31, 2010), 19 pgs.

Meyer, Bertolt, et al., "skillMap: dynamic visualization of shared organizational context", Institute of Information Systems, Humboldt University Berlin, (Feb. 20, 2006), 13 pgs.

Pretschner, Alexander, "Ontology Based Personalized Search", Department of Electrical Engineering and Computer Science, University of Kansas, (1998), 125 pgs.

Stankovic, Milan, et al., "Looking for Experts? What can Linked Data do for you?", LDOW, (Apr. 27, 2010), 10 pgs.

Steggles, Andy, "Keeping Score of Your Online Member Engagement", Associations Now, [Online]. Retrieved from the Internet: <URL: http://www.asaecenter.org/Resources/ANowDetail.cfm?ItemNumber=3828>, (Jan. 2009), 7 pgs.

Tang, Jie, et al., "ArnetMiner: An Expertise Oriented Search System for Web Community", International Semantic Web Conference—ISWC, (2007), 8 pgs.

Yimam-Seid, Dawit, et al., "Expert Finding Systems for Organizations: Problem and Domain Analysis and the DEMOIR Approach", Journal of Organizational Computing and Electronic Commerce 13(1), (2003), 1-24.

Zhang, Jing, et al., "Expert Finding in a Social Network", Department of Computer Science and Technology, Tsinghua, University Database Systems for Advanced Applications—DASFAA, (2007), 1066-1069.

"U.S. Appl. No. 13/710,248, Response filed Jul. 30, 2015 to Final Office Action mailed Mar. 30, 2015", 16 pgs.

* cited by examiner

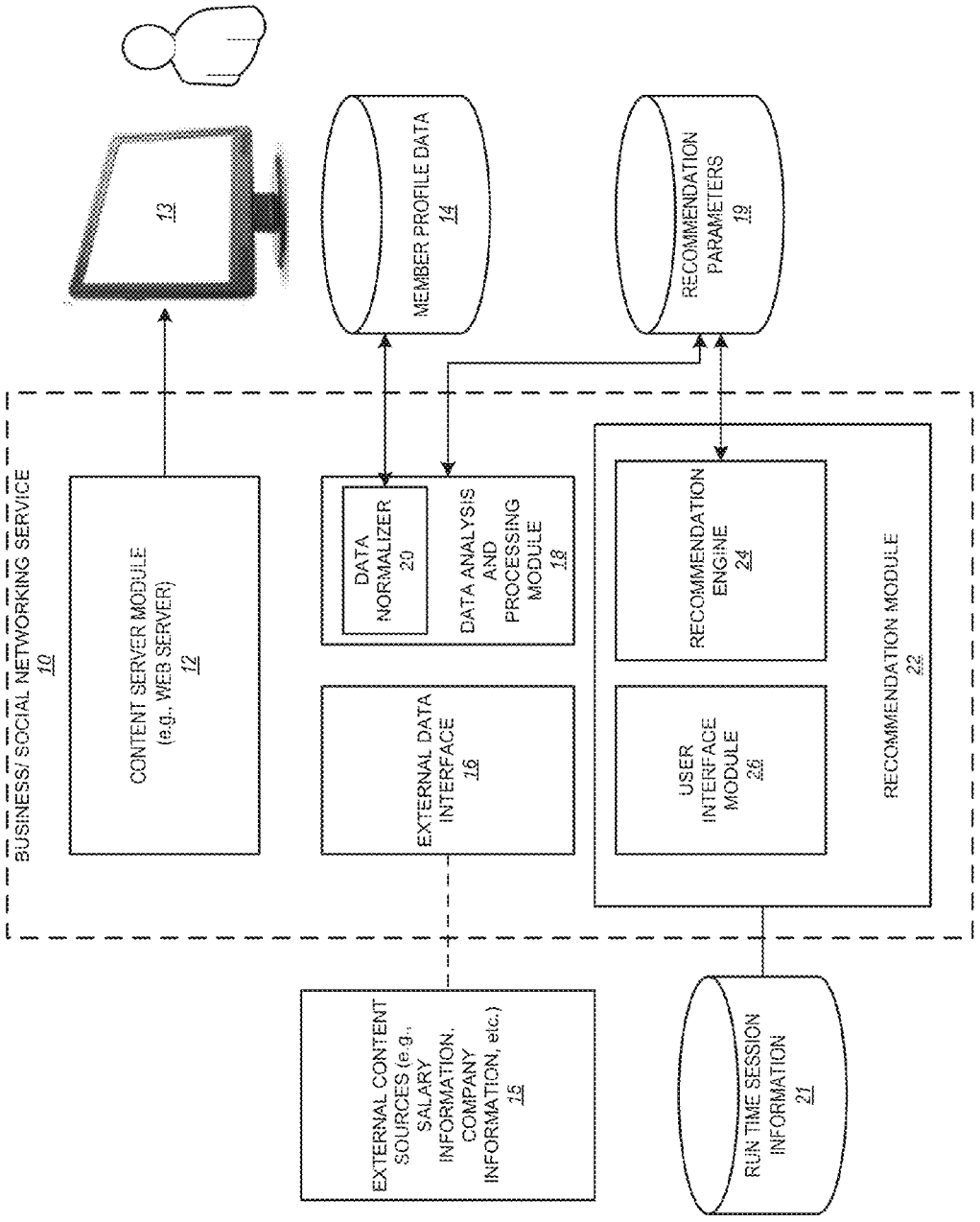

13
MEMBER PROFILE DATA
14
RECOMMENDATION PARAMETERS
19
BUSINESS/ SOCIAL NETWORKING SERVICE
10
CONTENT SERVER MODULE
(e.g., WEB SERVER)
12
DATA NORMALIZER
20
DATA ANALYSIS AND PROCESSING MODULE
18
RECOMMENDATION ENGINE
24
RECOMMENDATION MODULE
22
EXTERNAL DATA INTERFACE
16
USER INTERFACE MODULE
26
EXTERNAL CONTENT SOURCES (e.g., SALARY INFORMATION, COMPANY INFORMATION, etc.)
15
RUN TIME SESSION INFORMATION
21

FIG. 1

FIG. 2

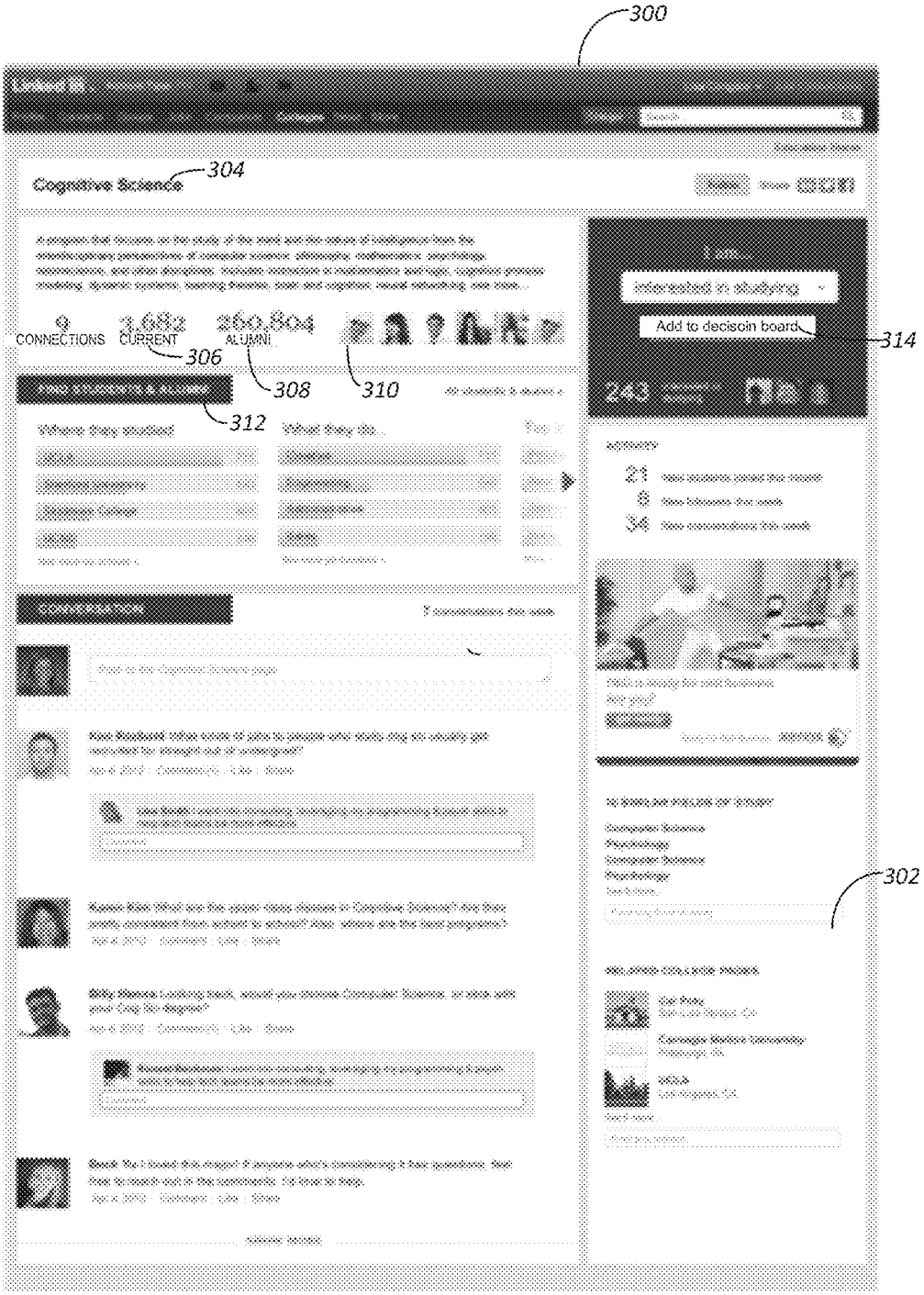

300
304
Cognitive Science
CONNECTIONS
3,682
CURRENT
260,804
ALUMNI
306
308
310
312
Add to decision board
314
243
302

FIG. 3

400
Lisa Congdon's Decision Boards
408
410
411
409
Graduate school decision board 8
420
405
402
416
406
414
409
Lisa, add more schools or choose a degree that interests you.
403
404
407
DEGREE
MASTER OF ARTS
PSYCHOLOGY
412
418

FIG. 4

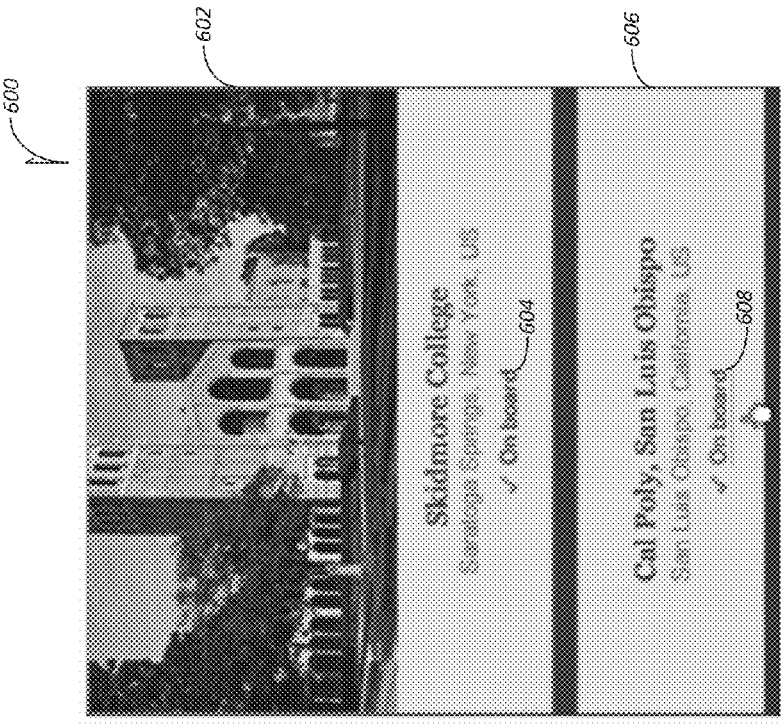

600
602
Skidmore College
Saratoga Springs, New York, US
On board
604
606
Cal Poly, San Luis Obispo
San Luis Obispo, California, US
On board
608

FIG. 6

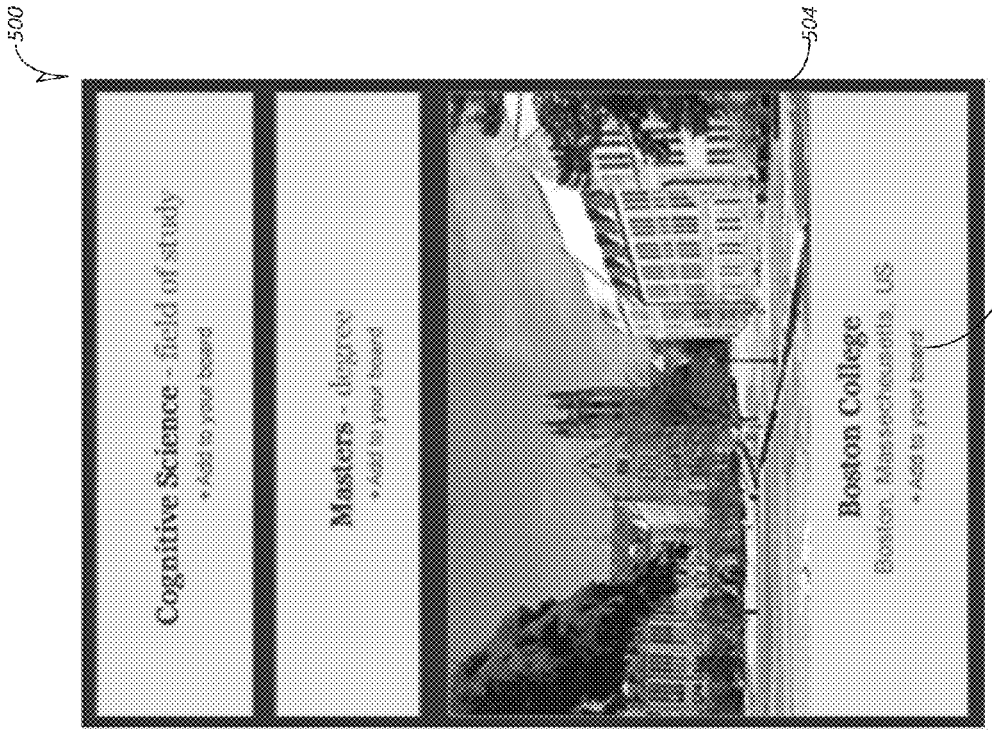

500
Cognitive Science - field of study
Masters - degree
504
Boston College
502

FIG. 5

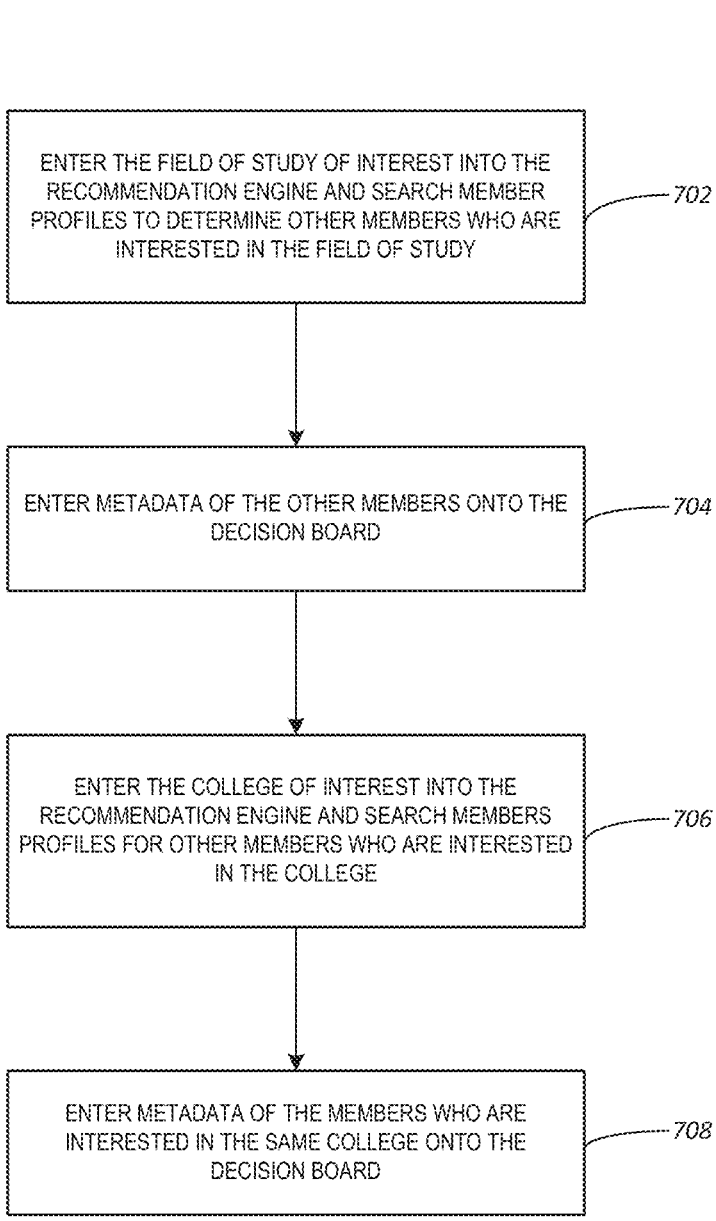

700
ENTER THE FIELD OF STUDY OF INTEREST INTO THE RECOMMENDATION ENGINE AND SEARCH MEMBER PROFILES TO DETERMINE OTHER MEMBERS WHO ARE INTERESTED IN THE FIELD OF STUDY
702
ENTER METADATA OF THE OTHER MEMBERS ONTO THE DECISION BOARD
704
ENTER THE COLLEGE OF INTEREST INTO THE RECOMMENDATION ENGINE AND SEARCH MEMBERS PROFILES FOR OTHER MEMBERS WHO ARE INTERESTED IN THE COLLEGE
706
ENTER METADATA OF THE MEMBERS WHO ARE INTERESTED IN THE SAME COLLEGE ONTO THE DECISION BOARD
708

FIG. 7

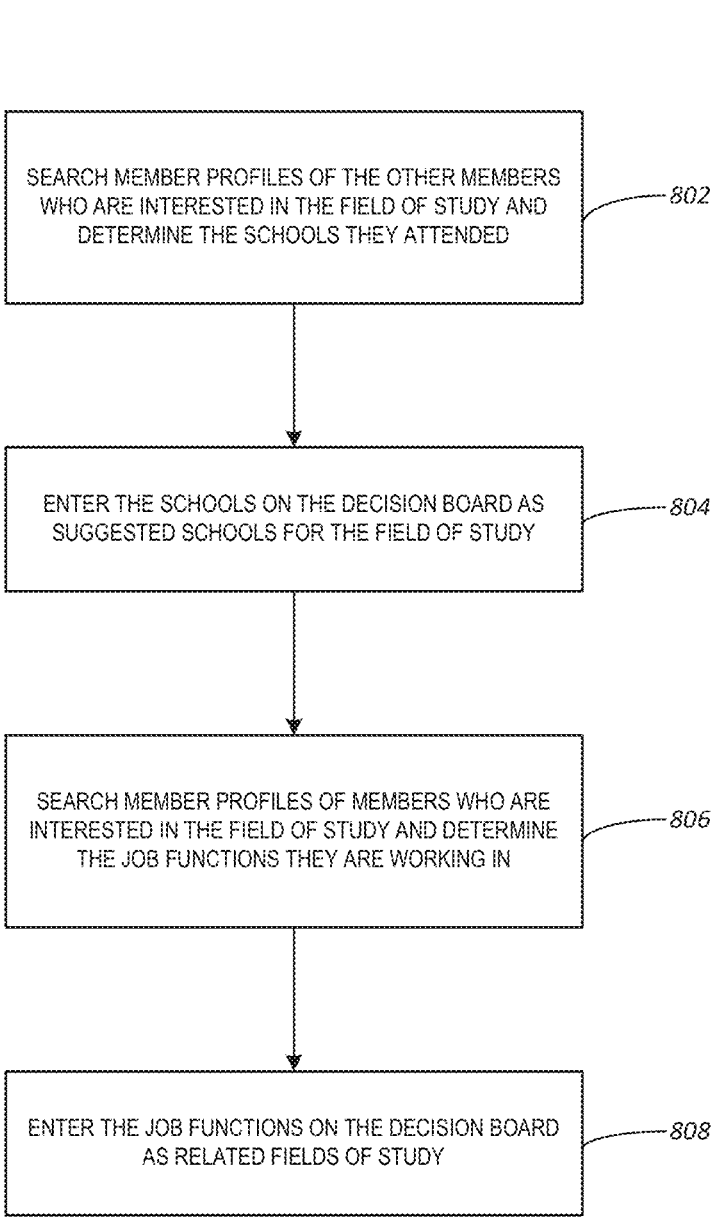

800
SEARCH MEMBER PROFILES OF THE OTHER MEMBERS WHO ARE INTERESTED IN THE FIELD OF STUDY AND DETERMINE THE SCHOOLS THEY ATTENDED
802
ENTER THE SCHOOLS ON THE DECISION BOARD AS SUGGESTED SCHOOLS FOR THE FIELD OF STUDY
804
SEARCH MEMBER PROFILES OF MEMBERS WHO ARE INTERESTED IN THE FIELD OF STUDY AND DETERMINE THE JOB FUNCTIONS THEY ARE WORKING IN
806
ENTER THE JOB FUNCTIONS ON THE DECISION BOARD AS RELATED FIELDS OF STUDY
808

FIG. 8

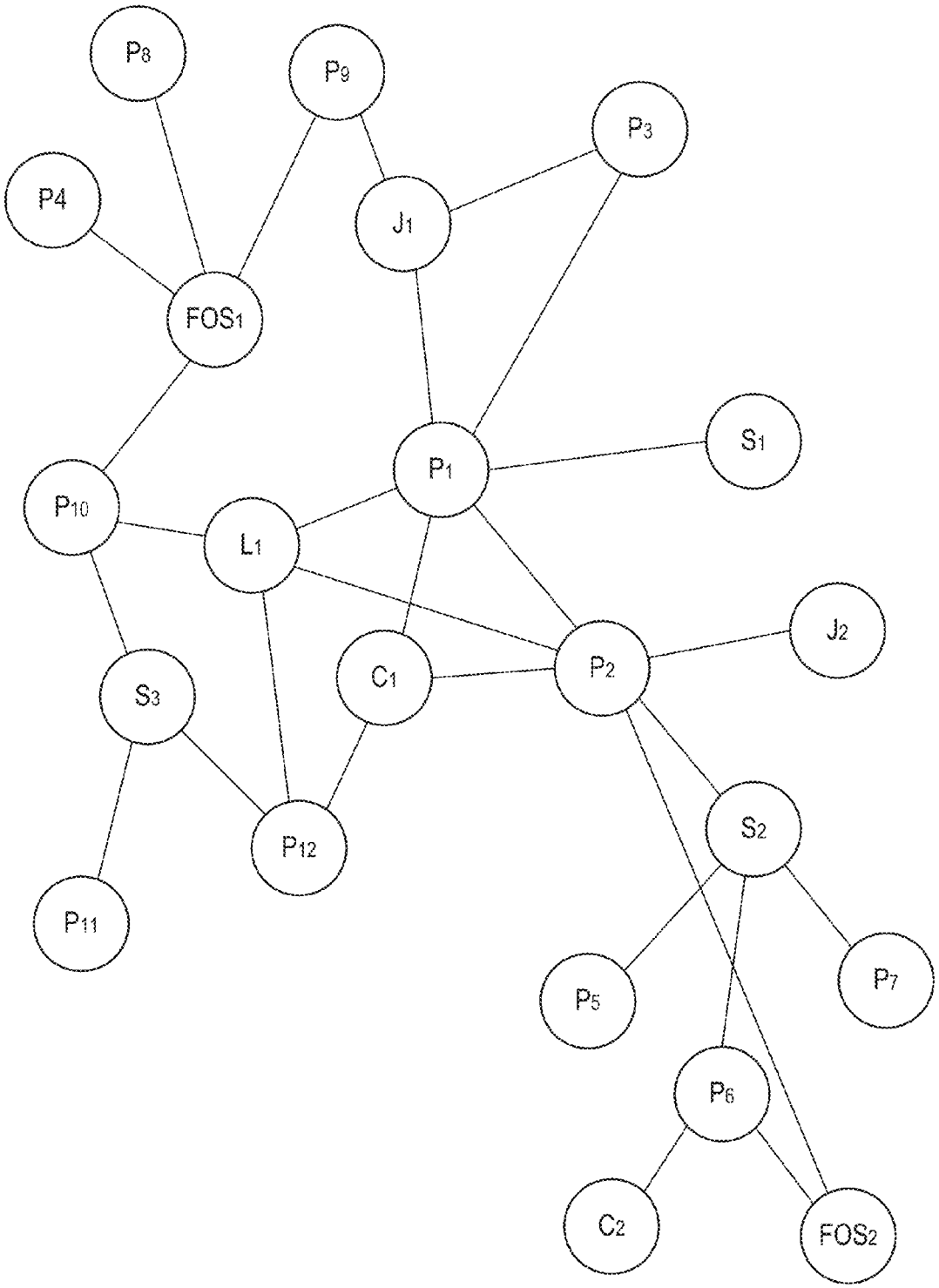

P8
P9
P3
P4
J1
FOS1
S1
P1
P10
L1
J2
C1
P2
S3
S2
P12
P11
P5
P7
P6
C2
FOS2

FIG. 9

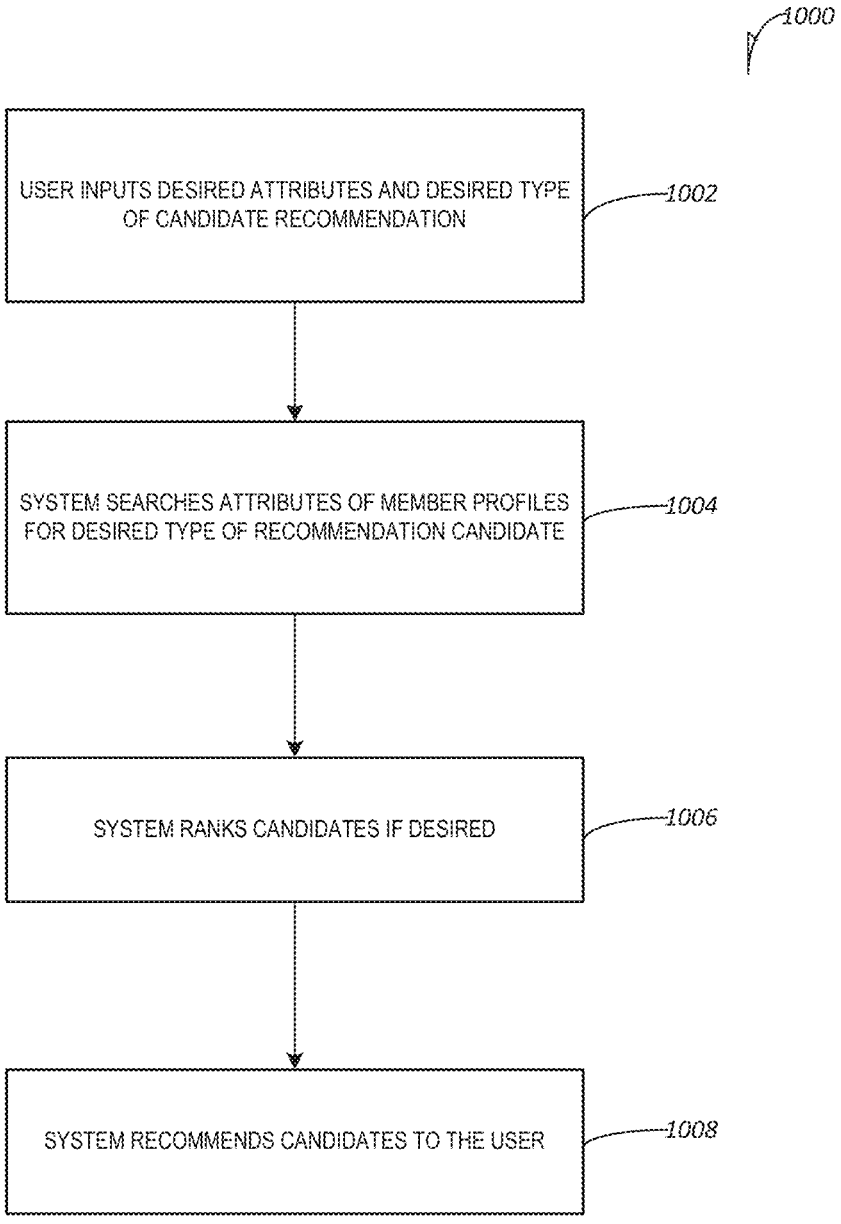

1000
USER INPUTS DESIRED ATTRIBUTES AND DESIRED TYPE OF CANDIDATE RECOMMENDATION
1002
SYSTEM SEARCHES ATTRIBUTES OF MEMBER PROFILES FOR DESIRED TYPE OF RECOMMENDATION CANDIDATE
1004
SYSTEM RANKS CANDIDATES IF DESIRED
1006
SYSTEM RECOMMENDS CANDIDATES TO THE USER
1008

FIG.10

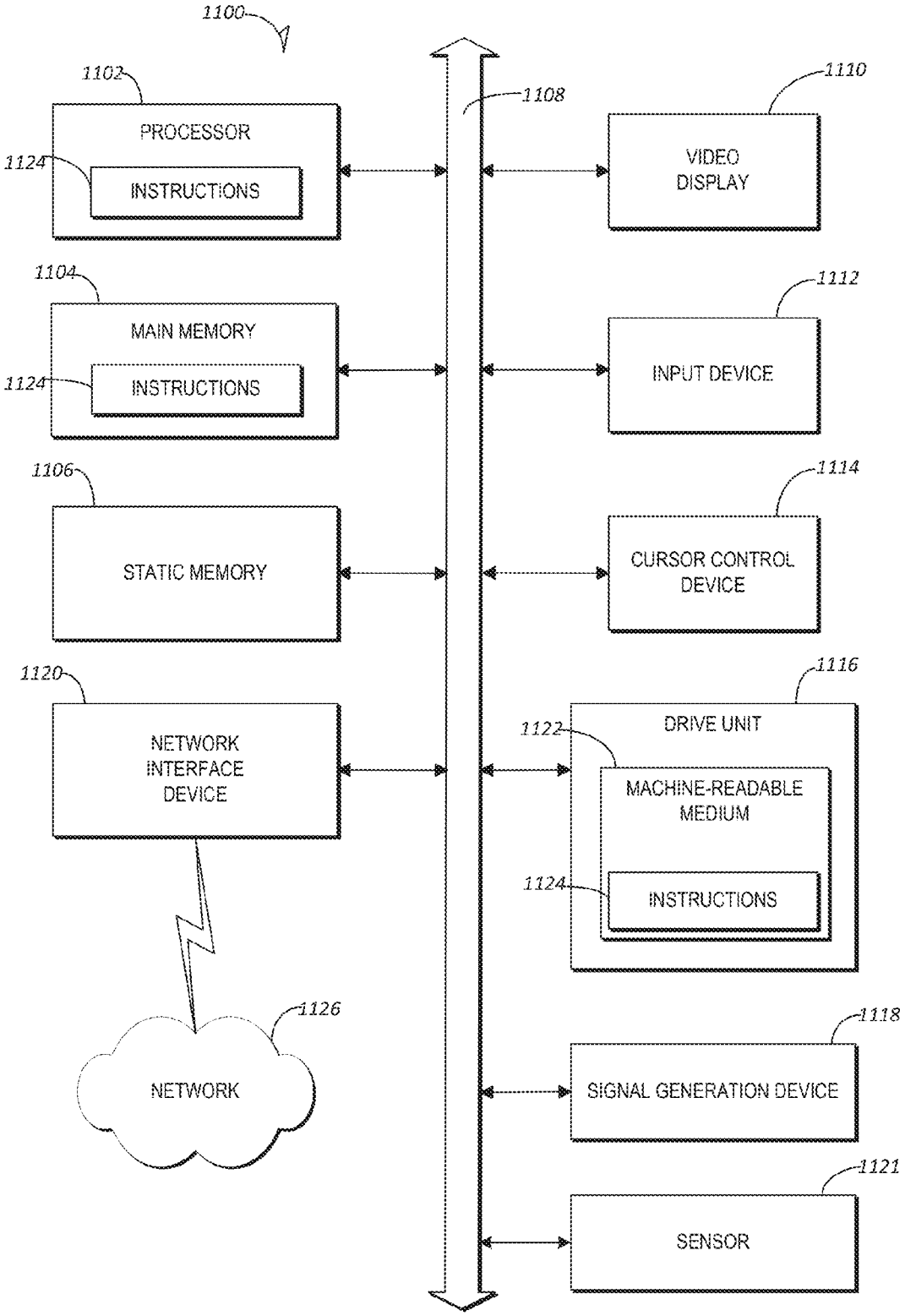

1100
1102
PROCESSOR
1124
INSTRUCTIONS
1104
MAIN MEMORY
1124
INSTRUCTIONS
1106
STATIC MEMORY
1120
NETWORK INTERFACE DEVICE
1126
NETWORK
1108
1110
VIDEO DISPLAY
1112
INPUT DEVICE
1114
CURSOR CONTROL DEVICE
1116
DRIVE UNIT
1122
MACHINE-READABLE MEDIUM
1124
INSTRUCTIONS
1118
SIGNAL GENERATION DEVICE
1121
SENSOR

FIG. 11

USING ATTRIBUTES ON A SOCIAL NETWORK FOR DECISION-MAKING SUPPORT

RELATED APPLICATION

This application is related to and claims priority under 35 U.S.C. §120 to patent application Ser. No. 13/710,248 entitled "Methods And Systems For Providing Decision-Making Support," which was filed on Dec. 10, 2012, which is assigned to the assignee of this application, and which is hereby incorporated herein by reference in its entirety.

TECHNICAL FIELD

The present disclosure generally relates to data processing systems and techniques for processing and presenting content within an online social network environment. More specifically, in one embodiment, methods and systems for analyzing and aggregating information to facilitate the decision-making process college-bound students go through in deciding on a school to attend. Students may provide career aspiration data to a user interface provided by a system that uses a recommendation engine and data from a vast social network of professionals to obtain collective recommendations for students making such a decision. Multiple input data can yield refinement of the recommendations

BACKGROUND

A social network service is a computer or web-based application that enables its members or users to establish links or connections with persons for the purpose of sharing information with one another. In general, a social network service enables people to memorialize or acknowledge the relationships that exist in their "offline" (i.e., real-world) lives by establishing a computer-based representation of these same relationships in the "online" world. Many social network services require or request that each member provides personal information about himself or herself, such as professional information including information regarding their educational background, employment positions that the member has held, and so forth. This information is frequently referred to as "profile" information, or "member profile" information. In many instances, social network services enable members, with the appropriate data access rights, to view the personal information (e.g., member profiles) of other members. Although such personal information about individual members can be useful in certain scenarios, it may not provide many insights into "big picture" questions about various university degrees, professions, careers, and individual jobs or employment positions, among other things.

Additional detail about the technological operation of social networks useful in embodiments hereof may be found in U.S. patent application Ser. No. 13/430,284 entitled "Leveraging a Social Graph for use with Electronic Messaging," assigned to the assignee of this patent, and incorporated herein by reference in its entirety.

DESCRIPTION OF THE DRAWINGS

Some embodiments are illustrated by way of example and not limitation in the FIGS. of the accompanying drawings, in which the same or similar reference numerals have been used to indicate the same or similar features unless otherwise indicated.

FIG. **1** is a functional block diagram illustrating various functional modules or components of a social/business network service, with which an embodiment described herein might be implemented;

FIG. **2** shows a user interface in the form of a college page that provides information about a particular college in accordance with an embodiment.

FIG. **3** shows a user interface in the form of a field of study page that provides information about a field of study a member may be interested in, in accordance with an embodiment.

FIG. **4** shows a user interface in the form of a decision board a decision board according to an embodiment;

FIG. **5** shows three items that a first member is viewing on the decision board of a second member, where the three items have not yet been added to the first member's decision board, according to an embodiment;

FIG. **6** shows two items that a first member is viewing on the decision board of a second member, where the two items have already been added to the first member's decision board, according to an embodiment;

FIG. **7** is a flow chart illustrating the operation of a recommendation engine to determine data relevant to a decision being made, according to an embodiment;

FIG. **8** is a flowchart illustrating another operation of a recommendation engine to determine data relevant to a decision being made, according to an embodiment; and

FIG. **9** is an illustration of small part of the social graph of the social network service;

FIG. **10** is a flow chart showing operation of another algorithm that may be executed by a computer processor according to an embodiment; and

FIG. **11** is a block diagram of a machine in the example form of a computer system within which a set of instructions for causing the machine to perform one or more of the methodologies discussed herein.

DETAILED DESCRIPTION

Methods and systems for obtaining and presenting information about members of a social network service who share common interests in schools, degrees, fields of study, professions and other interests or attributes are described. For example, although an embodiment herein describes common interest in post-secondary schools, degrees, fields of study and careers, one of ordinary skill in the art will readily recognize that additional embodiments could describe common interests in the same general class of subject matter in respect of organizations such as high schools, elementary schools, and even professional certification or accreditation institutions (e.g., LSAT prep, CFA, and the like). Further, although members of a social network service are referred to herein (sometimes called "students" or "student members"), the term "member," "student," or "student member" may extend to any party having access rights to view a member's profile or other pages in the social network service, and who is looking for recommendations in making decisions based on real life outcome as described by information in member profiles.

In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the various aspects of different embodiments of the present invention. It will be evident, however, to one skilled in the art, that the present invention may be practiced without these specific details.

Disclosed is a platform to provide, in one embodiment, support when making a decision to attend a school that is likely to lead to a desired career path. Such a platform will be

referred to herein as a decision board or a decision user interface. A student may express his or her career aspirations by adding relevant data to a decision board, and obtain recommendations of schools likely to lead to that career, based on real career outcomes of members of a social network service. The recommendations may also relate to degrees, fields of study to undertake in order to improve the opportunity of reaching the desired career. Further, the student may invite friends and family, the student's network, and even alumni, to help the student decide on a degree, a field of study and/or a college to attend. This method is not limited to decisions relating to which school to attend and which fields of study to pursue, but may also be used as support after graduation for job decisions, for career milestone decisions, and other decision that relate to member profiles. Generally, for the example of a student making a decision of what school to attend, a decision board is a place for student members to keep track of the schools, fields of studies and degrees they are interested in pursuing. A student can then share this information with their network so that they can get feedback and recommendations from others. The method of operation of the decision board in the embodiment includes recommending additional schools or fields of studies based on career outcome similarity based on actual career outcomes of members of the social networks service, as well as additional features.

A decision board is particularly useful since many social network services, and particularly those with a professional or business focus, request, or even require, members to provide various items of personal information, including information concerning a member's educational background, employment history and career. This information can then be used for recommending decisions based on data provided on the decision board, and can refine recommendations based on additional data provided on the decision board by the person seeking the recommendation. Social network service members may be prompted by the data entered on the decision board to provide information concerning the schools and universities attended, the dates or years of attendance, the subject matter concentration (e.g., academic concentration or major), as well as the professional certifications and/or academic degrees that the member has obtained. Similarly, a member may be prompted to provide information concerning the companies for which he or she has worked, the employment positions (e.g., job titles) held, the dates of such employment, the skills obtained, and any special recognition or awards received, the information indicating actual, real life, outcomes. The data that is requested and obtained may be structured, or unstructured. Other information may be requested and provided as well, such as a professional summary, which summarizes a member's employment skills and experiences, or an objective or mission statement, indicating the member's professional or career aspirations. For purposes of this disclosure, the above-described data or information is generally referred to as member profile data or member profile information. Furthermore, each individual item of data or information may be referred to as a member profile attribute. Member profile data, including career outcomes, can then be used for providing the above recommendations as herein described.

Consistent with some embodiments, a social network service includes a recommendation aggregation service, which is referred to hereinafter as a "recommendation engine" or "recommendation application." Consistent with some embodiments, the recommendation application analyzes and aggregates the member profile information of all (or some subset of) members of the social network service to provide, in one embodiment, a rich and easy to access set of tools that enables members to explore and discover a variety of recommendation information, and possibly trends, concerning various schools as they relate to industries, professions, employments positions, and/or careers.

FIG. **1** is a functional block diagram illustrating various functional modules or components of a business/social network service **10**, with which an embodiment might be implemented. The various functional modules illustrated in FIG. **1** may be embodied in hardware, software, or a combination thereof. Furthermore, although shown in FIG. **1** as a single set of modules, a skilled artisan will appreciate that with some embodiments, the individual components may be distributed amongst many server computers, forming a distributed, cluster-based architecture. In addition, as presented in FIG. **1**, the recommendation application is represented as recommendation module **22** integral with the social network service **10**. In other embodiments, the recommendation application may be a separate web-based application that simply uses one or more sets of application programming interfaces (APIs) to leverage one or more separately hosted social network services. The term recommendation application and recommendation module may be used interchangeably herein to mean the same module or application.

As illustrated in FIG. **1**, the social network service **10** includes a content server module (e.g., a web server module) **12** configured to send and receive information (e.g., web pages, or web-based content) with various web-based communication protocols to various client applications and devices, including web browser applications and/or other content rendering applications. With some embodiments, members interact with the service **10** via a web browser application, or some other content rendering application, that resides and executes on a client computing device, such as that with reference number **13** in FIG. **1**. Client computing devices may include personal computers, as well as any of a wide number and type of mobile devices, such as laptop computers, tablet computers, mobile phones, and so forth. By interacting with the client computing device, a member can request and receive web pages from the service **10**. With some embodiments, the web pages will prompt the member to provide various member profile attribute information (e.g., schools and/or universities attended, academic degrees received, academic majors, employment history information, and so forth), which, is then communicated to the service **10** and stored in a storage device as member profile data **14**.

The service **10** includes an external data interface **16** to receive data from one or more externally hosted sources. For instance, with some embodiments, certain information about companies and/or particular job titles or employment positions (e.g., salary ranges) may be obtained from one or more external sources. With some embodiments, such data may be accessed in real-time, while in other embodiments the data may be imported periodically and stored locally at the social network service that is hosting the recommendation application.

With some embodiments, the volume of member profile data that is available for processing is extremely large. Accordingly, as shown in FIG. **1**, with some embodiments, the social network service **10** includes a data analysis and processing module **18**. With some embodiments, this processing module may be implemented with a distributed computing system, such as Apache™ Hadoop™. The processing module **18** obtains as input various attributes of member profile information, and then processes this information to ensure that it is in a usable form for the recommendation application. For instance, the data normalizer module **20** will

normalize various elements of data, ensuring that they conform to some standard that is used by the recommendation application. With some embodiments, the various job titles that members specify for themselves are normalized by deduplicating and disambiguating the job titles. For instance, in many cases, the same employment position will have a different job title at different companies. Accordingly, with some embodiments, the data normalizer module **20** will deduplicate job titles by mapping the different job titles, as specified in members' profiles, to uniquely named job titles for use with the recommendation application. In addition to deduplicating job titles, with some embodiments the data normalizer will disambiguate job titles. For instance, in many cases, a particular job title may be used in two different industries, such that the two employment positions represented by the same job title are really very different. A few examples include the job titles, "associate" and "analyst." A financial analyst may be a completely different position from a security analyst, and so forth. Accordingly, with some embodiments, the data normalizer **20** will analyze various elements of a member's profile to determine the industry in which the member works, such that the job title for the member can be specified uniquely for that industry. The originally input data, before standardization, may be stored in case it is needed in the future to check standardization. In that instance it is a copy of the originally input data that may be used for standardization by data normalizer module **20**.

In addition to normalizing various items of information, with some embodiments, the processing module **18** obtains or otherwise derives a set of recommendation parameters from or based on profile attributes of the members for use in making recommendations as discussed below. At least with some embodiments, these parameters are updated periodically (e.g., daily, nightly, bi-daily, weekly, every few hours, etc.) to take into account changes members make to their profiles.

Recommendation parameters are stored for use with the recommendation application **22**, as shown in FIG. **1** in a database with reference number **19**. With some embodiments, the recommendation parameters are stored in a distributed key-value storage system, such as the open sourced storage system known as the Voldemort Project™. Also illustrated in FIG. **1** is a recommendation engine with reference number **24** which is used to process the recommendation parameters to obtain ranking results as discussed below. At run-time, the recommendation parameters are quickly retrieved, and then used with one or more sets or one or more vectors to determine ranking of schools, as one example, which may be provided to a member interface in absolute or weighted format. With some embodiments, the profile attributes specified by the member for use with the recommendation application may be separately stored with run-time session information, as illustrated in FIG. **1** with reference number **21**.

As further illustrated in FIG. **1**, the recommendation module **22** includes a recommendation engine **24**, and a user interface (UI) module **26**. The recommendation engine analyzes and aggregates the recommendation parameters and, in some cases, the member profile data, as discussed in greater detail below. The user interface module **26** includes logic for presenting the information in various formats, for example, as shown in the example user interfaces presented in the attached figures.

Certain attribute information from the member profiles of members of a social network service are retrieved and analyzed for the purpose of normalizing the information by the data normalizer **20** for use with the recommendation application **22**. For instance, with some embodiments, job titles may be specified (as opposed to selected) by the members of the social network service and therefore will not be standardized across companies and industries. As such, with some embodiments, the normalizer module **20** will analyze the profile information from which certain job titles are extracted to ascertain an industry specific job title. Accordingly, with some embodiments, the recommendation application will utilize a set of unique, industry specific job titles. Of course, other attributes beside job titles may also be normalized.

Career aspiration information, as one example, may be provided to the social network service in several ways. For example, FIG. **2** is a user interface that is a college page that provides information about a particular college. As used herein "college page" may be any organization's or entity's information display on a user interface that illustrates identity and attributes of an organization such as a college or other organization or entity. The college page is an example and the entity it represents is not limited to a school. In the case of a college page, the identity will be the name of the college or university or other school or other organization, and attributes include activities, connections, students following the school by social network, conversations concerning the school, the number of students interesting in attending the school in the future, ranking of the school, similar schools, and the like. Visitors to the college page who are seeking information about the college may operate the interactive pivot table **202** to find information about the college to the extent of the data included in the alumni profile of social network service.

A pivot table of this type is described in U.S. patent application Ser. No. 13/647,027, entitled "Methods and Systems for Obtaining and Presenting Alumni Data" and incorporated herein in its entirety by this reference. If the college is one of interest to the visitor, the member may click selectable icon **204** that enables the member to add the college page to the member's decision board, as discussed subsequently.

FIG. **3** is a user interface in the form of a field of study page, which may be referred to as a field of study display, that provides information about a field of study the member may be interested in, in accordance with an embodiment. A user, who may be a student, may enter a field of study as at the drop down menu **302**. For example, the user may be interested in studying cognitive science which, when entered by way of drop down menu **302** becomes the subject of the field of study page as at **304**. Alternately, instead of using a drop down menu of inputs which may be limited to predetermined inputs, the UI may be designed to enable the user to enter his or her own input by way of a search box. When this information is entered it is transmitted to the social network service that then searches its database of profiles to find current students **306** studying cognitive science and alumni **308** who have studied cognitive science. The profiles searched may be all the profiles in the social network service, or some smaller set such as the profiles of members in the social graph of the student. By the user clicking on **306** or **308**, selectable images or other meta data **310** of the people studying cognitive science may be presented on the member's field of study page **300**. Clicking on the icon of a particular image or other meta data **310** will allow the member to access a particular member's profile or field of study page to learn more about the person, their aspirations, achievements, and other information that may be helpful in making the decision under discussion. Further, helpful alumni data may be seen and accessed as at **312**, and as described in the above-referenced U.S. patent application Ser. No. 13/647,027.

FIG. **4** shows a user interface in the form of a decision board **400**, sometimes referred to as a decision user interface, according to an embodiment. In FIG. **4** the member, here Lisa, has pinned a college page of interest, here Skidmore

College **402**, also seen in FIG. **2**, and a field of study **405** that indicates a field of study she is interested in, here Cognitive Science, also seen in FIG. **3**, to her decision board **400**. Lisa may choose a degree that interests her as at **403**, either by typeahead that enters the name from the first few letters typed, or by typing the full name and entering that name, either by depressing Enter, or by selectable entry icon that may be displayed at **403**, if desired. Lisa has added another college page, that of Cal Poly, at **406** to her decision board **400**. The data from a college page and from the field of study page may be transmitted to the system. The system may then compare the college which is the subject of the college page, for example, Skidmore College, to other colleges stored in the system, and display on the member's decision board **400** the names of suggested similar schools as at **407**. Similar schools may be determined as described in U.S. patent Ser. No. 13/647,004 entitled "Methods and Systems for Identifying Similar Entities," filed on even date herewith, assigned to the common assignee, and incorporated herein by reference in its entirety. Recommended schools may also be determined as set forth in FIG. **8**, discussed subsequently. For a decision interface that includes plural college pages such as Skidmore College **402** and Cal Poly **406**, appropriate timing means, not shown, may be provided in one embodiment to enable the system to search separately in respect of Skidmore College and separately in respect of Cal Poly. The system likewise searches its member profiles and displays on the decision board a plurality of selectable icons **414** or other meta data (here placed on the Skidmore College page **402** of Decision Board **400**) indicating other members who have placed Skidmore College on their decision boards. The same or similar operation may be performed for Cal Poly in the embodiment of FIG. **4**.

Similarly, placing the cognitive science field of study page **405** on the decision board **400** will result in the system searching its member profiles and displaying a plurality of selectable icons **416** or other meta data of members who have placed the same field of study on their decision boards.

Lisa may also add to her decision board **400** a degree she is interested in by entering the degree at **403**. When entered, the degree may be displayed on Lisa's decision board at **412**. The degree is entered as data to be transmitted to the system which will then compare the degree to other degrees stored in the system. The system will then display on the Lisa's decision board **400** the names of suggested schools offering the degree, again at **407** or at some other suitable area of decision board **400**, much the same as was discussed for college pages and field of study pages above. Similarly, the system may search its member profiles and/or the decision boards of other members to determine members who have the same degree, or who have an interest in obtaining the same degree. The system may display on Lisa's decision board **400** a plurality of selectable icons **418** or other meta data of members who have placed the same degree on their decision boards or who have otherwise expressed an interest in the degree on their profile.

By selecting any of the plurality of icons **414**, **416**, **418**, the member will be able to access the profiles, field of study pages, college pages of interest, and decision boards of other members who are making the same or similar decisions as the member, and who have similar interests, or a similar set of interests, in colleges, fields of study, and/or degrees. The member, here Lisa, may also add to her decision board **400** an organization or college page or degree she sees on one of the decision boards accessed by selecting an icon of the groups of icons **414**, **416**, or **418**. For example, Lisa may have selected an icon **414** of a particular member, viewed the selected member's decision board, seen a Boston College college page on the selected member's decision board, decided she may be interested in Boston College and, consequently, added Boston College to the her decision board at **400**. This may be done by a selectable icon on the college page that is pinned to the decision board being viewed by Lisa, that is, the decision board of a member accessed by icon **414**.

An example of this is seen in FIG. **5** where there is seen, in partial view, a decision board **500** that is seen by Lisa when accessing a member icon at **414** of FIG. **4**. A college page seen in partial view, here Boston College **504**, is pinned to, or has been added to, or appears on, decision board **500**. Lisa may pin or add the Boston College college page **504** to her decision board by selecting the "add to your board" icon **502** of FIG. **5**. The system will then add the Boston College college page to Lisa's decision board of FIG. **4** as at **404**.

When Lisa selects a member icon **414** at FIG. **4** as described above, and accesses that member's decision board, she may see that that member has also added some of the same college pages as Lisa has on her college page of FIG. **4**. This is seen in FIG. **6** where there is seen, in partial view, decision board **600**, where the member Lisa accessed by selectable icon **414** had added Skidmore College **602** and Cal Poly **606** to that member's decision board. When Lisa accessed that member's decision board at **414**, the system searched Lisa's member profile, found her decision board, and compared its contents against the contents of decision board **600**, and determined that Lisa had already added both Skidmore College **602** and Cal Poly **606** to her decision board. Therefore, in the rendering of the decision board Lisa accessed by selectable icon **414**, the entries for Skidmore College **602** and Cal Poly **606** have the icon "On board" **604** and **608**, respectively, in order to notify Lisa that she already has these entities or items on her board and need not add them.

The member, here Lisa, may email a copy of her decision board **400** to friends and family as at **408**, and receive by email or other modes of communication recommendations relevant to Lisa's decision. The member may also send the decision board **400** out to friends or others on other social network services such as by using the LinkedIn icon **409**, Twitter icon **410**, or Facebook icon **411**, or other relevant icons, and ask for and receive back recommendations for schools, fields of study, or other comments relevant to the decision under discussion.

Flowcharts

FIG. **7** is a flow chart illustrating the operation **700** of a recommendation engine to determine data relevant to a decision being made, according to an embodiment. The operations of FIG. **7** are set forth in a particular order but one of ordinary skill in the art will recognize that the operations may be arranged in different order and reach the same or a similar result. At **702** the system enters the field of study of interest into the recommendation engine **19** of FIG. **1** which searches member profiles to determine other members who are interested in that field of study and at **704** enters metadata of those other members onto the decision board as at **416** of FIG. **4**. At **706** the system enters the college of interest, here Skidmore College, **402**, into the recommendation engine and searches member profiles for other members who are interested in the college. In one embodiment this may be accomplished by accessing college boards included on decision boards of other members to determine their colleges of interest. The system may then at **708** enter metadata of the members who are interested in Skidmore College, in this example, onto the decision board **400** of FIG. **4** at **414**.

FIG. **8** is a flowchart illustrating another operation **800** of a recommendation engine to determine data relevant to a decision being made, according to an embodiment. At **802** the

system may use recommendation engine **19** of FIG. **1** to search member profiles of the other members who are interested in the field of study seen at **404** of FIG. **4** and determines the schools the members attended. This may be accomplished, in one embodiment, by accessing field of study boards on the decision boards of the other members. At **804** the schools so determined may be entered on the decision board **400** of FIG. **4** as suggested schools for the field of study as at **407**. The system may then at **806** search member profiles of members who are interested in the field of study and determine the job functions those interested members are working in. At **808** the system may enter those job functions on the decision board **400** of FIG. **4** as related fields of study **409**.

The above and other aspects of various embodiments can be understood by considering the amount of information available to the social network service. For example, and as discussed previously, many social network services require or request that each member provide personal information about himself or herself, such as professional information including information regarding their educational background such as field of study at college, employment position or job, company of current employment, location of that company, and so forth. This information is frequently referred to as "profile" information, or "member profile" information. A view of a small part of the social graph of the social network service **10** of FIG. **1** is seen in FIG. **9**. In that figure, some, but not all, of the connections and attributes of various members of the social network service are illustrated. For example, member P1 attended school S1, works at company C1 at location L1 and majored in field of study FOS1 when at school S1. At company C1, P1 has job J1. Location L1 school S1, company C1 and job J1 are said to be attributes of P1. Further to the example of FIG. **9**, P2 went to school S2, studied field of study FOS2, has job J2 and, like member P1, is employed at company C1 at location L1. Other members who attended school S2 are members P5, P6, and P7. Members P4, P8, P9, and P10, also have field of study FOS1. Member P10 attended school S3, which was also attended by members P11 and P12. Tracing through the figure, which is not intended to be a complete set of attributes of the members illustrated, can provide additional information about the various attributes of the various members in the figure. When the entire social graph of the social network service is considered, an immense amount of information about members and their attributes can be determined.

In view of the amount of member profile information available to the social network service, embodiments are not limited to the recommendation application **22** searching merely for a single school or a single focus of study for the recommendation. As one example, the recommendation engine **24** may analyze the attributes of the member profiles as described above and determine from the member attributes the members who graduated with a degree in cognitive science, and the schools from which the members received their degrees in cognitive science. The recommendation engine may determine, as one example, the school from which the most members received their degree in cognitive science and recommend that school to the member seeking to make a decision. Or schools, in an order desired by the system designer, for example the top five schools by number of degrees in cognitive science awarded to members, could be presented to the user by the recommendation engine.

Further, the recommendation application may search the attributes of the member profiles and determine that people who pursued computer science as a field of study had jobs as computer programmers. The system may also determine from the attributes of the profiles that some members who were computer programmers pursued mathematics instead of computer science as a field of study. If the user were seeking one of the best schools for becoming a computer programmer, the recommendation engine, from the foregoing search, could recommend schools that ranked high in awarding degrees in computer science and degrees in mathematics to members.

The recommendation may also be refined. For example, if the user were now to enter an additional field of study at **302** of FIG. **3**, for example, forensic psychology, the recommendation application may search member profiles to determine which schools provided degrees in both cognitive science and forensic psychology and present these schools, in some desired order, to the user. Given that there is now an additional field of study, here forensic psychology, the school or schools recommended would likely change, thus refining the recommendation based on the user's aspirations.

Generally speaking, the system can provide recommendations for nearly any use case if the user specifies his or her aspirations, such as in one embodiment providing a field of study and a location of the country desired for employment, and requesting recommendations for companies in that location with that need people who pursued that field of study. This may be done, of course, by modifying the user interface of FIG. **3**. One of ordinary skill in the art, given the information described above, would understand how to modify the user interface to accept, for example, two attributes as input (for example field of study and desired location), and also to accept a desired recommendation candidate type (for example, companies for employment). The member profiles could be searched, the people having the aspired-to field of study in the aspired-to location as attributes could be determined, and the company or companies they are employed at in that location could also be determined. Those companies could be recommended to the user.

Further, if a user were a manager in a particular company and was seeking to hire, for example, a product manager, that user may input qualifications as attributes, such as field of study and product manager as the job type, and receive back a list of members of the social network service that have those attributes. Further, the attributes inputted as qualifications for the desired recommendation need not be limited to two attributes, but could include a further desired number of attributes. The user seeking to hire a product manager might also input people in the user's own company who was also seeking a product manager for collaboration in determining which of the recommendations returned to the manager as job candidates might be best for that position. This is similar in nature to the above example of inputting a field of study and getting back names of members who are also interested in that field of study, along with comments. Stated another way, the method might include inputting the attributes sought after in a making a decision, receiving a recommendation of candidates (whether schools to attend, fields of study to pursue, personnel to hire, and the like), and inputting attributes for a peer group with whom to collaborate on making the decision the user is seeking to make, or for a group for other social processing or communication.

Referring now to FIG. **10** there is seen a method **1000** of an embodiment as described above. At **1002** the user inputs aspired-to, which may mean desired, attributes and the desired type of candidate recommendation. At **1004** the system searches the attributes of member profiles for the type of recommendation candidate with the desired attributes. At **1004** the system may, if desired, rank the candidates such as in a manner described above as one example. Finally, at **1008** the system recommends one or more of the candidates to the

user. The user could then if desired operate the method again for a second recommendation, with the input attributes being desired second attributes. The system may again searches the attributes of member profiles for the type of recommendation candidate with the desired second attributes. In an embodiment a candidate with at least some of the desired second attributes may be used by the member for social collaboration or social communication with respect to the first recommendation, or for any collaboration desired.

The various operations of example methods described herein may be performed, at least partially, by one or more processors that are temporarily configured (e.g., by software) or permanently configured to perform the relevant operations. Whether temporarily or permanently configured, such processors may constitute processor-implemented modules that operate to perform one or more operations or functions. The modules referred to herein may, in some example embodiments, comprise processor-implemented modules.

Similarly, the methods described herein may be at least partially processor-implemented. For example, at least some of the operations of a method may be performed by one or more processors or processor-implemented modules. The performance of certain of the operations may be distributed among the one or more processors, not only residing within a single machine, but deployed across a number of machines, in some example embodiments, the processor or processors may be located in a single location (e.g., within a home environment, an office environment or as a server farm), while in other embodiments the processors may be distributed across a number of locations.

The one or more processors may also operate to support performance of the relevant operations in a "cloud computing" environment or as a "software as a service" (SaaS). For example, at least some of the operations may be performed by a group of computers (as examples of machines including processors), these operations being accessible via a network (e.g., the Internet) and via one or more appropriate interfaces (e.g., Application Program Interfaces (APIs).)

The various operations of example methods described herein may be performed, at least partially, by one or more processors that are temporarily configured (e.g., by software) or permanently configured to perform the relevant operations. Whether temporarily or permanently configured, such processors may constitute processor-implemented modules or objects that operate to perform one or more operations or functions. The modules and objects referred to herein may, in some example embodiments, comprise processor-implemented modules and/or objects.

Similarly, the methods described herein may be at least partially processor-implemented. For example, at least some of the operations of a method may be performed by one or more processors or processor-implemented modules. The performance of certain operations may be distributed among the one or more processors, not only residing within a single machine or computer, but deployed across a number of machines or computers. In some example embodiments, the processor or processors may be located in a single location (e.g., within a home environment, an office environment or at a server farm), while in other embodiments the processors may be distributed across a number of locations.

The one or more processors may also operate to support performance of the relevant operations in a "cloud computing" environment or within the context of "software as a service" (SaaS). For example, at least some of the operations may be performed by a group of computers (as examples of machines including processors), these operations being accessible via a network (e.g., the Internet) and via one or more appropriate interfaces (e.g., Application Program Interfaces (APIs)).

FIG. **11** is a block diagram of a machine in the form of a computer system within which a set of instructions, for causing the machine to perform any one or more of the methodologies discussed herein, may be executed. In alternative embodiments, the machine operates as a standalone device or may be connected (e.g., networked) to other machines. In a networked deployment, the machine may operate in the capacity of a server or a client machine in a client-server network environment, or as a peer machine in peer-to-peer (or distributed) network environment. In a preferred embodiment, the machine will be a server computer, however, in alternative embodiments, the machine may be a personal computer (PC), a tablet PC, a set-top box (STB), a Personal Digital Assistant (PDA), a mobile telephone, a web appliance, a network router, switch or bridge, or any machine capable of executing instructions (sequential or otherwise) that specify actions to be taken by that machine. Further, while only a single machine is illustrated, the term "machine" shall also be taken to include any collection of machines that individually or jointly execute a set (or multiple sets) of instructions to perform any one or more of the methodologies discussed herein.

The example computer system **1100** includes a processor **1102** (e.g., a central processing unit (CPU), a graphics processing unit (GPU) or both), a main memory **1101** and a static memory **1106**, which communicate with each other via a bus **1108**. The computer system **1100** may further include a display unit **1110**, an alphanumeric input device **1117** (e.g., a keyboard), and a user interface (UI) navigation device **1111** (e.g., a mouse). In one embodiment, the display, input device and cursor control device are a touch screen display. The computer system **1100** may additionally include a storage device **1116** (e.g., drive unit), a signal generation device **1118** (e.g., a speaker), a network interface device **1120**, and one or more sensors **1121**, such as a global positioning system sensor, compass, accelerometer, or other sensor.

The drive unit **1116** includes a machine-readable medium **1122** on which is stored one or more sets of instructions and data structures (e.g., software **1123**) embodying or utilized by any one or more of the methodologies or functions described herein. The software **1123** may also reside, completely or at least partially, within the main memory **1101** and/or within the processor **1102** during execution thereof by the computer system **1100**, the main memory **1101** and the processor **1102** also constituting machine-readable media.

While the machine-readable medium **1122** is illustrated in an example embodiment to be a single medium, the term "machine-readable medium" may include a single medium or multiple media (e.g., a centralized or distributed database, and/or associated caches and servers) that store the one or more instructions. The term "machine-readable medium" shall also be taken to include any tangible medium that is capable of storing, encoding or carrying instructions for execution by the machine and that cause the machine to perform any one or more of the methodologies of the present invention, or that is capable of storing, encoding or carrying data structures utilized by or associated with such instructions. The term "machine-readable medium" shall accordingly be taken to include, but not be limited to, solid-state memories, and optical and magnetic media. Specific examples of machine-readable media include non-volatile memory, including by way of example semiconductor memory devices, e.g., EPROM, EEPROM, and flash memory

devices; magnetic disks such as internal hard disks and removable disks; magneto-optical disks; and CD-ROM and DVD-ROM disks.

The software **1123** may further be transmitted or received over a communications network **1126** using a transmission medium via the network interface device **1120** utilizing any one of a number of well-known transfer protocols (e.g., HTTP). Examples of communication networks include a local area network ("LAN"), a wide area network ("WAN"), the Internet, mobile telephone networks, Plain Old Telephone (POTS) networks, and wireless data networks (e.g., Wi-Fi® and WiMax® networks). The term "transmission medium" shall be taken to include any intangible medium that is capable of storing, encoding or carrying instructions for execution by the machine, and includes digital or analog communications signals or other intangible medium to facilitate communication of such software.

Although an embodiment has been described with reference to specific example embodiments, it will be evident that various modifications and changes may be made to these embodiments without departing from the broader spirit and scope of the invention. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense. The accompanying drawings that form a part hereof, show by way of illustration, and not of limitation, specific embodiments in which the subject matter may be practiced. The embodiments illustrated are described in sufficient detail to enable those skilled in the art to practice the teachings disclosed herein. Other embodiments may be utilized and derived therefrom, such that structural and logical substitutions and changes may be made without departing from the scope of this disclosure. This Detailed Description, therefore, is not to be taken in a limiting sense, and the scope of various embodiments is defined only by the appended claims, along with the full range of equivalents to which such claims are entitled.

What is claimed is:

1. A method comprising:

receiving, by a computer processor, from a first member of a social network service who is a first person seeking to hire a candidate, a first set of attributes of a candidate desired as a recommendation for employment;

searching attributes of the profiles of other members of the social network service for entities having at least some of the first set of attributes;

presenting to the first member the identity of a plurality of the entities as a recommendation for employment;

receiving from the first member of the social network service, a second set of attributes, the second set of attributes comprising attributes of a second member of the social network service who is a second person seeking to hire a candidate having at least some of the first set of attributes, the second member qualifying as a member of a peer group for collaboration by discourse on making a decision with respect to the recommendation for employment;

searching attributes of the profiles of other members of the social network service for second members having at least some of the second set of attributes; and

presenting to the first member the identity of at least one of the second members as a recommendation for a member of the peer group, wherein the first member is seeking to hire one of the plurality of entities and the discourse is about a decision to hire one of the plurality of entities.

2. The method of claim **1** wherein the first member presents an additional set of attributes and the searching results in presenting to the first member a refined set of entities of for the recommendation for employment.

3. The method of claim **1** further comprising ranking the entities having the first set of attributes and presenting the ranked entities as recommended candidates.

4. The method of claim **1** wherein the recommendation for employment comprises a plurality of entities having different and equivalent attributes.

5. The method of claim **1** wherein the first set of attributes comprises a field of study and a school of graduation.

6. The method of claim **1** wherein the first set of attributes comprises a field of study and a geographical location and a name of a company.

7. The method of claim **1** wherein the first set of attributes comprises a job type and a name of a company and a geographical location.

8. The method of claim **1** wherein the first set of attributes comprises a field of study and a job type and a name of a company.

9. A non-transitory machine-readable medium having embedded therein a set of instructions which, when executed by a machine, causes execution of operations comprising:

receiving, by a computer processor, from a first member of a social network service who is a first person seeking to hire a candidate, a first set of attributes of a candidate desired as a recommendation for employment;

searching attributes of the profiles of other members of the social network service for entities having at least some of the first set of attributes;

presenting to the first member the identity of a plurality of the entities as a recommendation for employment;

receiving from the first member of the social network service, a second set of attributes, the second set of attributes comprising attributes of a second member of the social network service who is a second person seeking to hire a candidate having the first set of attributes, the second member qualifying as a member of a peer group for collaboration by discourse on making a decision with respect to the recommendation for employment;

searching attributes of the profiles of other members of the social network service for second members having at least some of the second set of attributes; and

presenting to the first member the identity of at least one of the second members as a recommendation for a member of the peer group, wherein the first member is seeking to hire one of the plurality entities and the discourse is about a decision to hire one of the plurality of entities.

10. The non-transitory machine-readable medium of claim **9** wherein the first set of attributes comprises a single attribute and the searching results in presenting to the first member the plurality of the entities as the recommendation for employment.

11. The non-transitory machine-readable medium of claim **9** wherein the first member presents an additional set of attributes and the searching results in presenting to the first member a group of the entities as a refinement of the recommendation for employment.

12. The non-transitory machine-readable medium of claim **9** further comprising ranking the plurality of the entities having the first set of attributes and presenting at least one of the ranked plurality of the entities as the recommendation for employment.

13. The non-transitory machine-readable medium of claim **9** wherein the recommendation for employment comprises a plurality of entities having different and equivalent attributes.

14. The non-transitory machine-readable medium of claim 9 wherein the first set of attributes comprises a field of study and a school of graduation.

15. The non-transitory machine-readable medium of claim 9 wherein the first set of attributes comprises a field of study and a geographical location and a name of a company.

16. The non-transitory machine-readable medium of claim 9 wherein the first set of attributes comprises a job type and a name of a company and a geographical location.

17. The non-transitory machine-readable medium of claim 9 wherein the first set of attributes comprises a field of study and a job type and a name of a company.

18. A system comprising:

a server having at least one processor configured to

receive from a first member of a social network service who is a first person seeking to hire a candidate, a first set of attributes of a candidate desired as a recommendation for employment;

search attributes of the profiles of other members of the social network service for entities having the first set of attributes;

present to the first member the identity of one of the plurality of entities as a recommendation for employment;

receive from the first member of the social network service, a second set of attributes, the second set of desired attributes comprising attributes of second members of the social network service who are persons seeking to hire a candidate having the first set of attributes, the second member qualifying as member of a peer group for collaboration by discourse on making a decision with respect to the recommendation for employment;

search attributes of the profiles of other members of the social network service for second members having at least some of the second set of attributes; and

present to the first member the identity of at least one of the second members as a recommendation for a member of the peer group, wherein the first member is seeking to hire one of the entities and the discourse is about a decision to hire one of the plurality of entities.

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